# COST *and* MANAGEMENT

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Extra copies of this journal may be obtained at 50c each to members and $1 each to non-members.

# Annual Meeting—Election of Officers

THE annual meeting of the Canadian Society of Cost Accountants was held in the Board of Trade Rooms, Royal Bank Building, Toronto, on March 30. The attendance was small, but all the chapters were represented.

Mr. John Craig, L.A., President of the Society for the past year, gave a review of the developments that had taken place. He described the steps which had led to the disaffiliation of the Canadian Society from the National Association of Cost Accountants. Referring to membership, Mr. Craig reported that there had been only a slight loss through the above change. He also outlined the policy pursued in connection with the first annual convention held last September in Montreal, and regarding the publication of literature by the Society.

The Directors elected for the coming year were:—

| | | |
|---|---|---|
| L. Belanger | Montreal | Chapter |
| C. H. Black | Toronto | " |
| Wm. Carswell | Montreal | " |
| J. E. Carruthers | Toronto | " |
| W. G. Donaldson | Hamilton | " |
| D. M. Farish | Montreal | " |
| H. E. Guilfoyle | Toronto | " |
| G. H. Houston | Toronto | " |
| Jas. Hutchison | Montreal | " |
| H. T. Jamieson | Toronto | " |
| T. S. Jardine | Toronto | " |
| G. C. Leroux | Montreal | " |
| S. G. Richardson | Hamilton | " |
| R. R. Thompson | Montreal | " |
| Jas. Turner | Toronto | " |

At a Directors' Meeting Mr. Belanger was elected President, and Messrs. James Turner and R. R. Thompson Vice-Presidents.

The Treasurer's Report showed:—

| | |
|---|---|
| Receipts | $7,287.77 |
| Disbursements | 7,425.99 |
| Balance of Assets over Liabilities | 149.50 |
| Cash on Hand and in Bank | 681.00 |

The Editorial Committee reported that arrangements were made for the continuance of the Society's Journal, and Mr. Belanger's report showed that Convention affairs were being very thoroughly provided for.

The following changes in By-Laws were passed:—

(A) That Article 3 "Government" be altered to read as follows: "The affairs of the Society shall be managed by a Board of Directors which shall consist of fifteen members in addition to the Chairman and Vice-Chairman of each Chapter."

(B) That Article 2 be altered to read as follows: "That the authority to fix the fees to be paid by the members of the Society shall be vested in the Board of Directors, but that the amounts shall not exceed Twenty Dollars per annum for senior members and Five Dollars per annum for junior members."

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## SOCIETY HEADQUARTERS ESTABLISHED

YOUR Executive is pleased to report that headquarters have been established at 81 Victoria Street, Toronto, and communications concerning the affairs of the Society should now be sent to this address.

Plans are being made by your Executive for increasing the usefulness of the Society to its members, not only through its monthly publication, but also through prompt attention to questions presented by members and in every other possible way. The second annual convention, to be held in Montreal in September, should be a real attraction, and all who are able to do so should arrange to attend. Topics of direct interest to the members will be discussed, and the Montreal members, along with your Executive, are sparing no effort to make the convention still more successful than the one held in Toronto last year. With the annual meetings of the chapters held, the new chapter officers are already making plans for the meetings of the coming season.

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# Elements of Standard Cost

By J. E. CARRUTHERS

*Export Manager, Durant Motors of Canada, Ltd., Leaside, Ont.*

(Before the Toronto Chapter, March 23, 1927)

THIS subject is a most debated one and one that dovetails in so closely with the placing of a firm on a "Budget Basis" that in my mind, unless the Budget is properly prepared in advance, it is impossible to establish a proper Standard Cost.

The object of this paper will be to endeavor to give an outline of how to go about establishing a standard Cost System. For the purpose of establishing a factor with which we are all familiar we will assume that burden is applied as a percentage to productive labor, and that productive labor is on a piece work or some other incentive basis.

The first thing to be considered is the *production budget.* A close scrutiny of the plant develops the fact that the capacity is "A" volume, and theoretically the standards should be based on that, but as it is beyond all expectations that 100% efficiency will be reached at all times we have to establish a volume which will be normally possible of attainment, which we will call *normal production* Volume "B." This volume should not be confused with one that is in all likelihood what you may actually attain, whether it be higher or lower—for in the one place the standard cost would drop too low, which might disastrously influence the establishing of selling prices, and on the other hand the costs would be too high, which might also affect the selling price so disastrously that the product would remain unsold. So it becomes necessary to establish the happy medium which we have termed Normal Volume "B." This is the volume which should be used as a basis for establishing standard costs and setting Selling Prices.

We will assume that we have studied our Plant Layout very carefully and have decided that we want 12 Productive Burden Centres. These Burden Centres would represent the different points at which burden should be applied to coincide with the product manufactured—for example:—

Product No. 30-31-32-33-34 is manufactured
Product No. 30—Passes through Burden Centres 1 to 6 inclusive
Product No. 31— " " " " 2 to 7 "
Product No. 32— " " " " 3 to 8 "
Product No. 33— " " " " 4 to 9 "
Product No. 34— " " " " 5 to 10 "

From this it can be readily seen that the burden rate of each one of these centres must be known so as to obtain a proper overhead distribution of the various lines of product manufactured.

**Production Labor**

Having arrived at our Productive or Burden Centres we will proceed to break down our Normal Volume "B" and spread it over these Centres. When this is done we will now break down the production by labor operations or groups of operations and when the labor operations have been carefully studied, the unit labor costs are applied to the Normal Production and extended. The result being the standard labor volume anticipated for each centre based on Normal Volume "B" and the Productive Labor of all the Centres being added together the Standard Productive Labor over all has been obtained.

At this point you may say,—This sounds very easy, but how do you get at your unit labor cost? As explained at the beginning of the paper a Piece Work basis was assumed. Where Piece Work is established the matter of unit labor is simple, for Piece Work, which has been set from Time Study, really represents Standard Labor Cost. Where an incentive method is used based on Time Standard it is a simple matter to arrive at a Unit Cost when a predetermined production is given. If labor is straight Day Work, you can only take previous experience or make a time study of it in setting unit labor costs and where feasible change your system to some incentive basis for it will facilitate your problems and have a tendency to make the employee more satisfied and industrious.

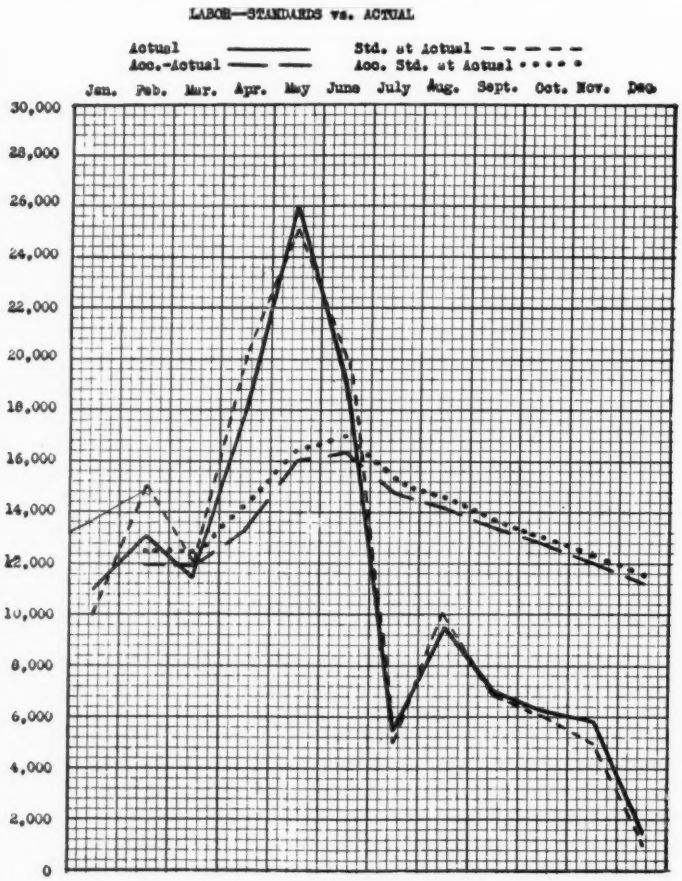
So that the standard set can be followed during the year it is best to have the results charted both monthly and accumulative average monthly by Productive Centres and in total showing:—

1. Standard labor per month.
2. Standard labor at actual volume per month.
3. Actual labor at actual volume per month.

4. Accumulative average standard labor at actual volume.

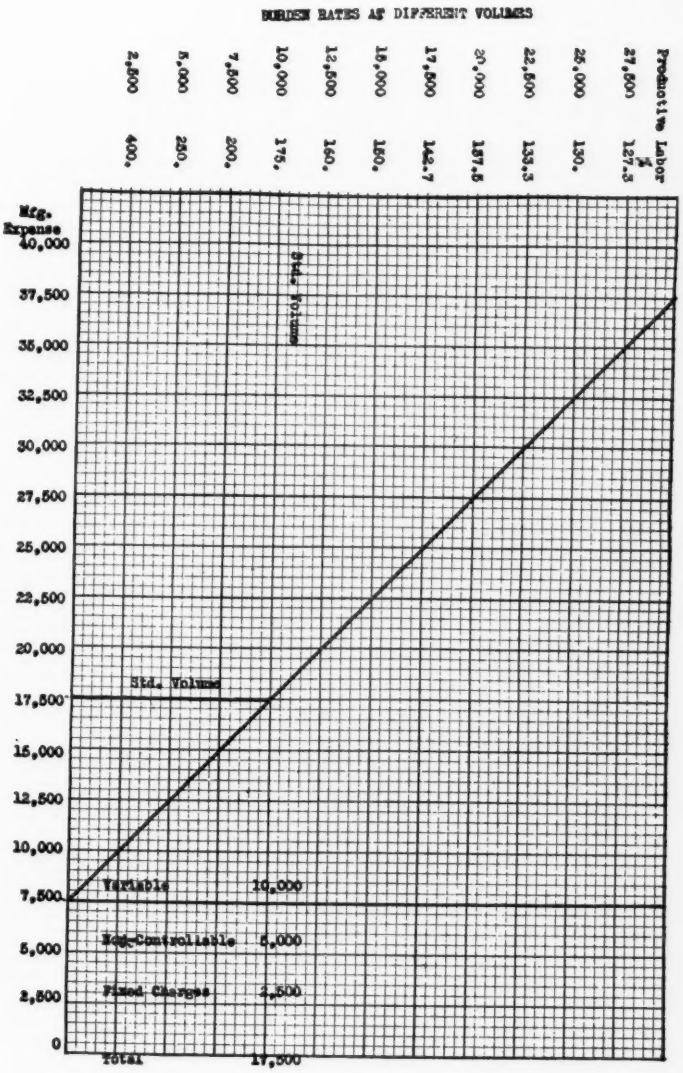
5. Accumulative average actual labor.

A specimen of this chart is shown herewith.

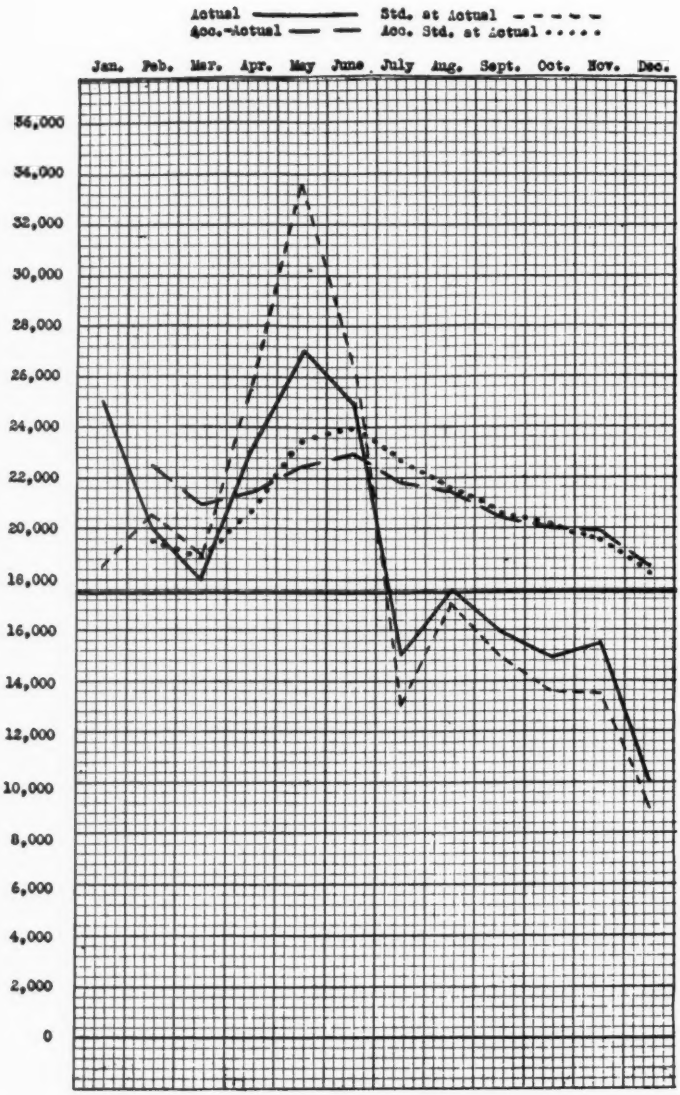



From this observations can be made as to how close the standards set are being lived up to and where the variation is too great it enables the management to either revise their standards or after analysing the conditions put their finger on the weak spots and correct them.

# ELEMENTS OF STANDARD COST



BURDEN CHART



## Burden

We will now turn to our Burden, see how we can standardize it, remembering that we are considering Burden as applied through the medium of percentage to Productive Labor and assume that there have been some past records to go to as a guide.

Let us take our manufacturing expenses and thoroughly analyze them and it will be found that some expenses rise and fall in ratio to Production—some are not affected by Production as long as Production keeps within certain reasonable limits—while others are irrevocably fixed no matter what your production. These three Manufacturing Factors we will call:—

(1) Variable Expenses.

(2) Constant Expenses.

(3) Fixed Expenses.

*Fixed Expenses:*—

These consist of such items as—Insurance, Taxes; Depreciation; Rentals or amortization of Land Improvements. Time will not permit me to go into the construction of all the details as their names are self-explanatory. However, a brief explanation of how to spread some of these expenses is given hereunder.

*Insurance*—Based on Floor Space and values according to location.

*Taxes*—Based on values.

*Depreciation*—Appraise the plant according to location of equipment, floor space, etc., and apply the authorized depreciation rates. The result obtained is charged to Manufacturing Expense while Plant Reserve is Credited.

*Rentals*—According to Floor Space.

*Constant Factors:*—

These would consist chiefly of Factory Administration departmental expenses, which would come under the General Burden Category—such as Purchasing, Material, Standards, Time Study, Engineering, Cost and Time Department, etc., but this is not all, for we do know that by applying one month or group of months against each other you will invariably find a factor which is constant and application of the following formula will not only establish the "Constant Factor" but will also establish the variable factors:—

**Formula for Figuring out Variable and Non-Controllable Expense**

High Production (a) Expense (b)
Low Production (c) " (d)

$$\frac{c \times 100}{a} = \%\ (e)$$

$b \times e$ = (Revised Manufacturing if the Expense decreased in the same proportion as the production decreased) (f)

$$\frac{d - f \times 100}{100 - e} = \text{N.C. or Constant Factor}\ (g)$$

$d - g$ — Variable (h)

$$\frac{h \times 100}{c} = \%\ \text{Variable to Prod. Labor}$$

**Inversely**

Low Production (a) Expense (b)
High Production (c) " (d)

$$\frac{c - a \times 100}{a} = \%\ \text{Increase}\ (c)$$

$e \times b$ plus $b$ = (Revised Manufacturing if the Expense increased in the same proportion as the production increased) (f)

$$\frac{f - d \times 100}{e} = \text{N.C. or Constant}\ (g)$$

$d - g$ — Variable (h)

$$\frac{h \times 100}{c} = \%\ \text{Variable to Prod. Labor}$$

The results now being charted our burden rate at any volume can be obtained. Our standard volume has been established, a look at the chart will reveal what the standard burden rate is and which should be applied in terms of percent to the Standard Labor by Productive Burden Centres to arrive at the Standard Burden. Herewith is a chart showing how this is worked out.

Once the Standard Burden Rate is set it behooves us to apply the actual burden versus the standard to follow up and see if our standards are accurate. The same principles obtain for charting the results of Burden as for labor, i.e.:—

1. Standard Burden.
2. Standard Burden at Actual Volume.
3. Actual Burden at Actual Volume.
4. Acc. Average Standard Burden at Actual Volume.
5. Acc. Average Actual Burden at Actual Volume.

It might be as well here to illustrate how the five figures above mentioned are prepared.

1st. *Standard Burden:—*

Having been set according to the practice previously outlined. The annual Standard Burden is divided into twelve equal parts—one part for each month.

2nd. *The Standard Burden at Actual Volume:—*

This is prepared by use of the following formula set:—

a — Production.
b — Std. Labor per unit.
c — Std. Labor at Actual Volume (a × b).
d — Std. % of Variable Mfg. Exp. to Std. Labor.
e — Std. Constant and Fixed Charges.

Then Standard Burden at Actual Production is:—

$$\frac{(c \times d \text{ plus } e)\ 100}{c}$$

in terms of percent to direct labor.

3rd. *Actual Burden at Actual Volume:—*

This is merely the tabulation of the actual current month's manufacturing expenses. It is really the comparison between Standard at Actual and Actual Burden that give you an indication of how the Standards are working out, but as the preparation of the Standards cover a period of time it is only right to assume that if your monthly figures do not tie in very closely—the accumulative average would. Therefore, the accumulative average figures are set up.

4th. *Accumulative Average Standard Burden at Actual Volumes:—*

This is secured by adding the monthly results together and dividing by the number of months, accumulated to-date. The same is also true concerning item No. 5. The Accumulative Average Actual Burden at Actual Volume.

## Material

The discussion of Standard Material costs may be divided under two headings, viz., (a) Quantity and quality of materials required, and (b) The price to be used for cost purposes.

(a) *Quantity and Quality of Materials required:—*

The examination of the product to be made takes place and all the materials in it are analysed and tabulated as to quantities required of each class of material and the

standardization of the materials themselves. The resultant list will represent the standard Bill of material required for each item of production and will include an average amount of normal waste for such items as lumber parts, parts cut from trimming materials, etc. All of which (to start with) are based on past experience having regard to current conditions.

Having established a *Standard Specification* it is used in two ways:—First as a requisition for the issuance of materials required for any given schedule; secondly, for cost purposes.

When the shop has secured the materials they must manufacture the number of pieces expected or explain why—in any case where additional material is required it would be charged to a Manufacturing Expense Account—under a sub-division of the Losses, Errors and Defect Accounts. This would enable the management to see that some condition in the plant was inefficient or that the standards set were incorrect; either of which conditions could be remedied.

(b) *The price to be used for cost purposes.*

As none of us will agree as to the proper method of dealing with this subject I will offer several different ways which might be discussed here:—

One way is to establish with the Purchasing Department a price on all parts that are likely to be purchased and having drawn up a schedule of these prices apply them to your Bill of Material or Standard Specification. This list would remain in force only so long as the price changes were of minor character, but the prices would be revised from time to time as conditions warranted it. All invoices of materials coming in would be adjusted according to the standard price list and difference would be written off to an Inventory Adjustment Account, which would be closed out each month as a cost adjustment figure. The Inventory Adjustment figure would be a guide to the management as to whether the Purchasing Department were buying properly. If they were falling down it might be necessary to have the Selling Prices revised as the original prices were set, based on the Purchasing Department's contract prices.

Another way is to determine what average inventory is being carried and cost the materials at the prices prevailing at the beginning of the average inventory period—i.e., sup-

pose an item cost you $1.00 in January and $1.50 in February and you were carrying an average inventory of one month ahead—the cost for February would carry January's prices and March's costs would reflect February's prices and so on.

Another way is by an averaging method. Some use twelve months' average, which is maintained by dropping the first month and adding the last—some use a two or three months' average by use of the some principles of dropping the oldest month and adding the newest.

There is also the weighted average method which consists of charging actual quantities and amounts to a previous balance and after determining the average unit costs, credits the stock with the quantities used in production multiplied by the average price. The balance is then carried forward to the next month and the same operations repeated.

Having discussed the factors of material, labor and other Factory expenses you will now assume that the subject so far as the paper is concerned has been covered—but do not forget that unless the whole organization is working on a Standard Basis it will be impossible to operate standards efficiently. It therefore becomes necessary to now refer to Selling and Administration Expenses and the standardization of capital invested. One of the best articles touching on this subject was written by Mr. Donaldson Brown and which appeared in the Management and Administration Magazine in January, February, March and April, 1924, issues. The March issue particularly touches on this subject.

### Administration and Sales

We have dealt with burden, splitting it into Fixed Charges—Constant and Variables—the same principles may be applied to the Selling and Administration Expenses, so that, by having this in mind, the percentage to Factory Cost of these Commercial Expenses can be readily obtained at different volumes.

A certain amount of working capital is required to operate a business at a Standard volume and this should be worked out in terms percent to Factory Cost of Production based on past experience having regard to present or proposed policies and conditions and the operations during the year should be closely watched to see that any fluctuations

from Standards are accounted for, i.e., such items as—Cash on Hand, Receivables, Rough Stores, Process Stores, Goods on hand, etc., are accumulated and (for the purpose of illustration) by taking the average of the monthly balances for the past year it is discovered that you had a certain amount outstanding every month—and which capital it was necessary that you should have to conduct the business during the year.

Suppose that Standard Cost of Production was $1,200,000.00 or $100,000 monthly:—

| | | Requirements monthly | |
|---|---|---|---|
| Cash | $10,000.00 | — month — | .83⅓ |
| Receivables | 5,000.00 | " | .41⅔ |
| Rough Stores | 20,000.00 | " | 1.66⅔ |
| Work in Process | 5,000.00 | " | .41⅔ |
| Goods on Hand | 8,000.00 | " | .66⅔ |
| | $48,000.00 | | 4.00 |

When the percentages as above have been established apply them to the Cost of Production for any month and the result will be the Standard Working Capital Requirements at actual volume as against which should be compared the actual results obtained. Close watching will benefit the management as by agressiveness the receivables can be reduced—the turnover of stores can be increased, etc., all of which means that less working capital is tied up and consequently the earning power of the capital invested is increased.

I forgot to mention that the working capital is in the nature of a variable factor, but we have our fixed investment to be taken care of also. Analyzing this it is found that having a plant valued at $360,000 and a Standard cost of Production of $1,200,000.00 a percentage of 30% to Factory Cost is obtained. If we want to attain say 25% return on Standard Capital Invested the following tabulation of the foregoing information will show up:—

| | | | | |
|---|---|---|---|---|
| Cash | .83⅓ | 25% | return | .208 |
| Receivables | .41⅔ | " | " | .104 |
| Rough Stores | 1.66⅔ | " | " | .417 |
| Work in Process | .41⅔ | " | " | .104 |
| Goods on Hand | .66⅔ | " | " | .167 |
| Fixed Investment | 30.00 | " | " | 7.50 |
| | 34. % | 25% | | 8.50 % |

so that every standard cost would have to be increased by 8½% plus the Selling and Administration which we will assume comes to 5% of Standard Factory Cost.

Summing up the above information tabulated in the previous paragraphs it is found that a Standard cost has been built up which tells the Management at what price he is to sell his product and that any deviations in such selling price will mean a loss if down, or additional profit if up.

The following is an assumed standard cost built up:—

| | |
|---|---|
| Standard Material Cost | $10.00 |
| Standard Labor Cost | 10.00 |
| Standard Burden Cost 175% | 17.50 |
| | $37.50 |
| Selling and Administration 5% | 1.88 |
| | $39.38 |
| Return on Capital Invested 8½% on $37.50 | 3.19 |
| Standard net Selling Price to the Company | $42.57 |

**Burden Chart**

| 100% Variable 7,500 Fixed and Non-Controllable | Standard at Actual | Actual | | |
|---|---|---|---|---|
| 11,000 + 7,500 | 18,500 | 25,000 | | |
| 13,000 | 20,500 | 20,000 | 19,500 | 22,500 |
| | 39,000 | 45,000 | | |
| 11,500 | 19,000 | 18,000 | 19,000 | 21,000 |
| | 58,000 | 63,000 | | |
| 18,000 | 25,500 | 23,000 | 20,875 | 21,500 |
| | 83,500 | 86,000 | | |
| 26,000 | 33,500 | 27,000 | 23,400 | 22,600 |
| | 117,000 | 113,000 | | |
| 19,000 | 26,500 | 25,000 | 23,917 | 23,000 |
| | 143,500 | 138,000 | | |
| 5,500 | 13,000 | 15,000 | 22,357 | 21,857 |
| | 156,500 | 153,000 | | |
| 9,500 | 17,000 | 17,500 | 21,688 | 21,313 |
| | 173,500 | 170,500 | | |
| 7,500 | 15,000 | 16,000 | 20,944 | 20,722 |
| | 188,500 | 186,500 | | |
| 6,250 | 13,750 | 15,000 | 20,225 | 20,150 |
| | 202,250 | 201,500 | | |
| 5,750 | 13,250 | 15,500 | 19,591 | 19,727 |
| | 215,500 | 217,000 | | |
| 1,500 | 9,000 | 10,000 | 18,708 | 18,917 |
| | 224,500 | 227,000 | | |
| Total | 224,500 | 227,000 | | |
| Standard 17,500 | 18,542 | 18,917 | | |

**Productive Labor**

Prod. 10.00 Unit

| Prod. | | Std. Rate | Std. at Act. | Actual | Acc. Av'g. | |
|---|---|---|---|---|---|---|
| Jan. | 1,000 | 10.00 | 10,000 | 11,000 | | |
| Feb. | 1,500 | 10.00 | 15,000 | 13,000 | 12,500 | 12,000 |
| | | | 25,000 | 24,000 | | |
| March | 1,200 | 10.00 | 12,000 | 11,500 | 12,333 | 11,840 |
| | | | 37,000 | 35,500 | | |
| April | 2,000 | 10.00 | 20,000 | 18,000 | 14,250 | 13,375 |
| | | | 57,000 | 53,500 | | |
| May | 2,500 | 10.00 | 25,000 | 26,000 | 16,400 | 15,900 |
| | | | 82,000 | 79,500 | | |
| June | 2,000 | 10.00 | 20,000 | 19,000 | 17,000 | 16,425 |
| | | | 102,000 | 98,500 | | |
| July | 500 | 10.00 | 5,000 | 5,500 | 15,286 | 14,857 |
| | | | 107,000 | 104,000 | | |
| Aug. | 1,000 | 10.00 | 10,000 | 9,500 | 14,625 | 14,188 |
| | | | 117,000 | 113,500 | | |
| Sept. | 700 | 10.00 | 7,000 | 7,500 | 13,778 | 13,445 |
| | | | 124,000 | 121,000 | | |
| Oct. | 600 | 10.00 | 6,000 | 6,250 | 13,000 | 12,725 |
| | | | 130,000 | 127,250 | | |
| Nov. | 500 | 10.00 | 5,000 | 5,750 | 12,273 | 12,091 |
| | | | 135,000 | 133,000 | | |
| Dec. | 100 | 10.00 | 1,000 | 1,500 | 11,333 | 11,208 |
| | | | 136,000 | 134,500 | | |
| | 13,100 | | | | | |
| Std. | 12,000 | 10.00 | 120,000 | 10,000 | monthly | |

# Estimates of the Quebec Streams Commission

By O. LEFEBVRE
*Quebec Streams Commission*

(Before the Montreal Chapter, March 11, 1927)

THE accountant and the engineer, when questioned regarding costs, are placed in very different positions. While the accountant is asked,—what was the cost? the question put to the engineer is,—what will be the cost? The accountant is dealing with facts, the engineer is dealing with probabilities. In other words, he is making an estimate. This estimate will be dependent, not only upon the engineer's ability and experience, but upon other factors beyond his control. There was a time when the engineer's estimate was more or less discredited. At the outset of my career, I was told by the manager of a large industrial concern in this Province, that when dealing with an engineer's estimate, he would first multiply the total by two, and some times the real cost exceeded this figure. This was largely due to the fact that estimates were prepared with altogether insufficient knowledge of the conditions under which the work would have to be carried out. The manufacturer, even the governments, were clamoring for estimates, but would not spend the money required for a complete preliminary investigation. To-day, this condition of affairs has been remedied, and an estimate is taken quite seriously. It does not follow, however, that it can be always right.

When your Chairman invited me to address your association, I was undecided as to whether I should limit myself to a description of the work carried out by the Quebec Streams Commission, but I thought that I should go further. With your permission, after describing the work of the Quebec Streams Commission briefly, we will together prepare an estimate of what a scheme for regulating the flow of the Gatineau River will cost.

You know that the water power resources of the Province of Quebec are very valuable. Their importance is increasing with the progress of industry and the improvement

in hydro-electric machinery. Statistics prepared by the Dominion Water Power Branch show that at low water flow, the rivers of the Province may supply, through their falls and rapids, an amount of 7,000,000 horse-power. On the basis of the flow available during six months in the year, the possibility of the same powers would be nearly 12,000,000 horse-power. At the end of the year 1926, there were developed in the Province, 1,793,000 h.p. or over 25% of the available low water supply. Water power has this characteristic that it is constantly renewed, and its use does not affect the quantity available. Power to-day has to be supplied mostly at points distant from the generating plant and it has to be supplied at any time during the year. Industry will not be satisfied with secondary power. All power tabulation must therefore be limited to the possibilities under low water conditions. In most of our streams, this low water prevails at the end of the winter, and high water prevails in the early spring. The proportion between high and low water would be about 25 to 1, sometimes more. The average low water is about 1/3 of a cubic foot per second per square mile of drainage area; that is, one stream having a watershed of a thousand square miles will discharge at the rate of 333 cubic feet per second at low water. The high water varies considerably from one stream to another. It is relatively higher on small streams than upon larger streams, the reason being that the same conditions do not prevail on all of the large rivers, in other words, the diversity factor is not applicable in the case of the small streams. At the time of high water, not only is the water being wasted, but very often it is the cause of heavy damages. Since 1913, a systematic measurement of the flow of the principal streams of the Province has been carried out. The water levels on the principal streams were recorded daily, and the gauge heights related to the discharge wherever possible. Since 1922, this work has been carried out by the Dominion Water Power Branch of the Department of the Interior, with headquarters in Montreal. By agreement with the Commission, the two services are co-operating to the advantage of the Province.

### Power Sites

The Commission has investigated, for the Department of Lands and Forests, a great number of power sites cover-

ing all districts in the Province. In most cases, a plan for the power development was submitted with an estimate of the amount of power available and the probable cost. For these investigations and studies, the Commission has spent to July 1st, 1926, a sum of $772,000.00. A large proportion of this money will eventually be refunded by the parties leasing power sites. A clause of the lease stipulates that the money spent by the Commission for surveys, plans, etc., must be refunded by the lessee. I want to make one point clear here. A great many people are under the impression that the Quebec Streams Commission has the control of water powers in the Province. Such is not the case. That control is under the Department of Lands and Forests, and through the Hydraulic Service of that Department, one must negotiate for the acquisition of any power site from the Crown. The Streams Commission investigates the value of power sites, it may advise the Government in that connection, but it does not negotiate for the lease of these sites.

I have stated that the value of powers is limited to the low water possibility. It is obvious that by increasing this low water flow, the power possibility may be proportionately increased. This increase usually results in very materially reducing the cost of producing power. How can this low water flow be increased? By creating storage reservoirs by means of dams holding back the surplus high water, thus changing the distribution of the water running off from the watershed. This has been the principal work of the Quebec Streams Commission.

A system of storage reservoirs has been constructed on the following streams:—the St. Maurice River; the St. Francis River on the south shore, in that section known as the Eastern Townships; on the Ste. Anne de Beaupré River; on the Mitis River, and Lake Kenogami. Storage propositions have been investigated and authorized on other streams, such as the North River, north of Montreal; Riviere du Loup (upper); Ste. Anne de la Pérade River; but no work has been commenced yet.

### Legislation

While the Act appointing the Commission gives that body authority to investigate conditions on any of the streams, a special Act of the Legislature has to be passed

giving the Commission the authority to construct dams and regulate the flow of certain streams and tributaries. A separate Act has to be passed for each stream. Such an Act gives the Commission authority, subject to approval by Lieutenant-Governor in Council, to construct dams, acquire existing dams necessary for its work, buy all lands to be flooded, either by mutual agreement or by expropriation, build new roads if required, and replace flooded highways. To pay the cost of all these works, the Provincial Treasurer is authorized to supply the Commission with the necessary funds,—the total amount not to exceed a figure mentioned in the Act. He may borrow money for the purpose, or he may take it out of ordinary revenue. These Acts are practically all worded in the same way.

Before any storage project is authorized by the Lieutenant-Governor in Council, the Commission has to supply the the Government with a complete report relating to the proposed works, their estimated cost, the companies likely to benefit by the said works and, if possible, the extent to which each company will benefit.

The Act gives the Commission the authority to collect annual dues from the benefitting companies. It may impose a tariff.

No storage scheme is undertaken until the Commission is assured of a yearly revenue sufficient to pay the interest charges, the sinking fund in thirty years, the cost of operating and maintaining the dams, plus a profit whenever possible.

### Gouin Dam

Gouin Dam is located on the St. Maurice River, 240 miles from the mouth of the river. The dam permits of a total control of the water supplied by a drainage area of 3,650 square miles. A series of large lakes at different levels have been combined into one lake forming a reservoir of a total capacity of 160 billion cubic feet, or 5,725 square-mile-feet. The dam is of the gravity section type. It was completed in December, 1917, and operated since the beginning of the year 1918. The water stored is used to regulate the minimum flow of the St. Maurice River at Shawinigan. When the dam was built the minimum guaranteed to the power companies was 12,000 cubic feet per second. For the last three years, the minimum flow has been held to 16,000 cubic feet per second.

Under natural conditions the minimum flow of the St. Maurice was about 6,000 c.f.s. It is seen, therefore, that the primary power of the hydro-electric plants on the St. Maurice River has been increased in the ratio of 6 to 16, or by 166%. The cost of this scheme was $2,500,000.00, and the annual revenue therefrom is $234,000.

The ratio of low water to high water flow at Shawinigan, under natural conditions, was 1 to 26, and under regulated conditions, it is 1 to 10. During high water periods the storage dam is completely closed.

The St. Maurice River, under regulated conditions, affords power possibilities of over one million horse-power, which is twice what it was under natural conditions.

### St. Francis Storage

At the head waters of the St. Francis River, a storage dam called "Allard Dam" was built and has been operated since 1918. It affords a complete control of the water supplied by a drainage area of 472 square-miles. The Lake St. Francis water was raised 18 feet above its natural high water,—the total depth of storage being 27 feet. The capacity of the reservoir is 12 billion cubic feet.

Another storage dam located at the outlet of Lake Aylmer affords a partial control of the water supplied by a drainage area of 135 square miles. The depth of storage on Lake Aylmer is twelve feet, and the volume of water stored is about 110 square-mile-feet.

The total cost of the storage on the St. Francis River was $750,000. The yearly revenue of the Commission is $70,000.00.

### Ste. Anne (de Beaupré)

Two wooden dams have been built on the River Ste. Anne de Beaupré, at a cost of $344,000. The two storage reservoirs, namely: the Lake Brulé and the Savane River, have a capacity of 12 and 20 square-mile-feet respectively. They are sufficient to regulate the minimum flow of the Ste. Anne River at the Laurentian Power Company's plant, at St. Ferréol, to 260 cubic feet per second. The revenue of the Commission from this storage is $34,000,000 yearly.

### Mitis River

On the Mitis River, the Commission has built a storage dam to regulate the flow of the river to a minimum of 350

second-feet at the plant of the Lower St. Lawrence Power Company, at Mitis Falls.

The dam, a stone filled crib structure, has been completed at a cost of about $120,000. The cost of clearing the flooded area and paying for land damages will bring the total up to $225,000.

### Lake Kenogami Dams

Lake Kenogami, in the Saguenay district, has a drainage area of 1,400 square miles. The lake itself has an area of 12 square miles, and lies at an altitude of 510 feet above mean sea level. It has two outlets: one at the Chicoutimi River flowing into the Saguenay, 15 miles distant. On this stream are located the plants of the Chicoutimi Pulp Company. The other outlet, is the River Au Sable, flowing through the towns of Jonquière and Kenogami to sea level in the Saguenay, 7 miles from the outlet. On this stream are located the plants of Price Brothers & Co. Ltd.

Under natural conditions, the plants on both streams could be operated at full capacity for only part of the year, seven or eight months. With the additional storage provided by the Commission, the same plants will be operated to full capacity for the whole year.

The regulated flow of Lake Kenogami is 1,800 cubic feet per second, which is distributed directly to the power plants. At no time is the dam closed.

Summarizing, the Commission has spent to date for storage $8,000,000.00 from which it receives an annual income of about $685,000.00.

The importance of regulating the flow of rivers is fully realized and admitted by all. It is an insurance against factory shut-downs and loss of time and business. It cheapens the production of power to a material extent.

During the winter 1923, low water conditions were so bad in the Province that industry would have suffered greatly only for the large amount of water which could be drawn from the Government reservoir on the St. Maurice River. As it was, the districts served by St. Maurice power did not suffer from the lack of water; neither did the St. Francis district. In other districts, however, plants were closed and trade and labor suffered a heavy loss.

While the revenue derived by the Commission is important, it is insignificant when compared to the advan-

tages which the Province at large derives from these works. This policy will be followed also for other streams which the Commission is now investigating.

**Gatineau River**

This policy is being extended and put into practice on the Gatineau River where a large storage reservoir is being completed.

The Gatineau River is the principal tributary to the Ottawa River, into which it flows from the north a few miles below Ottawa. It takes its rise between the Ottawa and the St. Maurice watersheds at an altitude approximately 1,200 feet above mean sea level. It has a drainage area at its mouth of 9,600 square miles. Its course is broken up by many falls and rapids which afford good power possibilities, provided that the low water flow can be controlled and increased to at least 8,000 or 9,000 cubic feet per second.

The flow of the stream has been recorded by the Department of Public Works of Ottawa, from 1905 to date. Complete records are available. It shows that at Chelsea the average low water is about 2,800 cubic feet per second, with extreme low at 1,900 cubic feet per second. In 1925, the International Paper Company was assured that summary investigations made by the Quebec Streams Commission showed the feasibility of controlling the flow to 8,000 cubic feet per second by the construction of a dam across the Gatineau River, behind which would be impounded a large proportion of the water running off a watershed of 6,200 square miles.

The Quebec Streams Commission was asked to prepare an estimate of the cost of carrying out this storage scheme, and it is this estimate that we shall revise together.

The reservoir investigated comprises Lake Baskatong and the valley of the Gatineau River from a point about 30 miles north of Maniwaki to a point 25 miles still further north. We have completed surveys of the reservoir sites, and are in a position to figure with accuracy the amount of water which can be stored at different elevations.

The amount of water required to hold a minimum flow of 8,000 cubic feet per second at Chelsea has been ascertained from records of flow previously mentioned.

We know that we must raise the water into Lake Baskatong by 50 feet, in order to give the reservoir the

capacity required. Low water in Lake Baskatong is 700 feet above mean sea level. We shall, therefore, raise the water to elevation 750 feet. At that elevation we know that outside of the control dam across the Gatineau River, we have to build many other dykes to prevent the water from being diverted from the reservoir. We have investigated all those sites. We know the nature of the ground outside of that covered by water. As to the latter, we have investigated it but we shall know definitely only after it has been unwatered.

The sites of the dams are located 30 to 35 miles from the railroad station at Maniwaki. We shall, therefore, have to include in our estimate the cost of a transportation system from Maniwaki to the different dams.

Having this information in January, 1926, we were asked what will the scheme cost?

The first item that we figure is the amount of work to be done. We have decided that the control dam shall be a concrete structure, that two of the principal dykes shall also be of concrete, and that three dykes on the west side of the river and four dykes on the east side of the river, will be earth and rock fills.

Let us here consider a difficulty which the engineer has to face in estimating the quantity of work to be done.

We know that we have rock. It is at the surface at some points, at other points covered by a few feet of earth and under water. Our structure must be built upon solid rock and our specifications will call for the removal of all faulty rock. The foundation must be free of seams,—it must be cleaned. We shall have to blast the surface of the rock. How much? When we built the Gouin dam, we had estimated two feet, and in the case of the Lake Kenogami dams, we had estimated four feet in the river bed and two feet on the banks, but our quantities of rock excavation were greatly increased, and in this instance, we should figure on having to remove the rock on an average depth of six feet. We can now figure out the amount of excavation.

We can also figure the amount of concrete which we will have to pour.

Having done this work for all of the units to be constructed, we know how much material we will have to haul

to the site of the dam: cement, steel, lumber. As the dams have to be completed by the spring of 1927, we have to haul 35,000 tons of material in about 14 months, besides the plant required.

How should this tonnage be hauled? Obviously by building a roadway on both sides of the river. There are roads which may be used for the purpose.

Taking the units on the west side of the river, we have 28 miles of road which will have to be improved and maintained at an estimated cost of $2,000.00 per mile. We have to build four miles of new road, which will cost $10,000.00 per mile. Using mostly motor-trucks over these roads, our estimate is that it will cost practically $0.60 per 100 lbs., or $12.00 a ton.

**Power**

To operate the plant, pumps, saw mill, air compressor, derricks, etc., we figure we shall require about 1,200 h.p. This power may be produced at the site by burning coal, or by oil-engines. It can be transmitted from a power plant at Maniwaki,—a distance of 32 miles. When the installation of a stationary plant at the dam site is considered together with the amount of fuel to be transported, we will conclude that the transmission line is the best and we will provide for such a line at a cost of $2,000.00 per mile, or $64,000.00. However, we must not take the chance that the work may be stopped by lack of power, and we will provide a battery of three oil-motors (Diesel Engine), each having a capacity of 180 h.p. This power will cost at the plant $25.00 per h.p. up to 800 h.p., and $20.00 per h.p. above 800 h.p. We are now sure that we will not run short of power.

Next item is camps: The work shall be carried out in uninhabited country and camps must be built to shelter the men and the staff. The construction of the Bittabee dam will require at least 600 men, there being a night and day shift. These men must be conveniently housed with a minimum of 300 cubic feet of air provided for each lodger. With this rule, the space of the camps is determined and the cost of the camp arrived at, $30,000.00. The men must be fed properly but they are hired on a basis of supplying their own board. In other words, they board at the camp but a deduction of $0.90, and sometimes $1.00 a day is made. This price is sufficient to cover the cost of the board,—the average price of a meal is about $0.33.

### Clearing

We have to clear the site, which is covered with bush. This clearing is estimated to cost $75.00 per acre.

The site of the dam has to be cleared of all stumps, roots, etc. The estimated cost is $250.00 per acre.

### Unwatering

Now we come to one of the most uncertain items in the cost of a dam. Though done with all the care possible, the cost of unwatering is generally a source of worry. We have to build a cofferdam so as to divide the river into two parts, —one section being unwatered at a time, as the flow of the river cannot be stopped. The cofferdam will consist of crib work filled with stone. The outside face of the crib will be sheeted with boards which a diver will adjust to the bottom. Then an earth-fill will be made on the outside face, —the idea being to make the dam as water-tight as possible.

When this first section of the cofferdam has been unwatered and the foundation of that part of the dam built, temporary openings will be left in the structure. This cofferdam will be removed and a new cofferdam built across the other section of the river,—the water being discharged through the temporary openings of the first section. In this cofferdam, we will have 16,140 cubic yards of crib work at $4.50 per cubic yard, 54 feet B.M. of sheeting at $100.00, and 3,700 cubic yards of earth fill at $1.50.

Having built the cofferdam, we must pump the water out and keep it out. It is estimated that the pumping will cost $50,000.00; stop-logs to close temporary openings will cost $5,000.00. Total cost of unwatering $140,000.00.

### Excavation

The earth excavation will cost $1.50 per cubic yard, and the rock excavation will cost $5.00 per cubic yard.

### Concrete

Now we come to concrete. We have three classes of concrete:

1:2½:5, 51,000 cubic yards.
1:2 :4, 5,500 cubic yards.
Reinforced concrete (slabs and beams).
1:2:4, 139 cubic yards.

The 1: 2½: 5 concrete, which is in mass, is estimated to cost $17.00 per cubic yard. The detailed estimate is as follows:

**Estimated cost of Concrete, Bittabee Dam—Per Cubic Yard**
Mass Concrete 1: 2½: 5

| | | |
|---|---|---|
| CEMENT: | | |
| 5½ bags @ 70c. net at Maniwaki (bags deducted) | $3.85 | |
| Hauling from Maniwaki to Bittabee; Loading; Unloading; Depreciation on Tractors; (Does not include road construction and maintenance, neither cement shed). 50 cents per bag—5½ × 50c. | 2.75 | |
| | | $ 6.60 |
| SAND: | | |
| Excavating; Hauling and Washing; $1.50 per c.y. 0.5 c.y. @ $1.50 | | .75 |
| STONE: | | |
| Quarrying and Crushing, $2.25 per c.y., 0.92 c.y. @ $2.25 | | 2.10 |
| MIXING AND PLACING: | | |
| Labor | | 1.00 |
| FORMS: | | |
| Lumber, wires, bolts, etc.; Labor for erecting and dismantling forms; Secondary tracking for distribution; Secondary wooden chute in forms, etc. | | 2.50 |
| POWER: | | |
| (Transmission line and Power House not included) | | .30 |
| PLANT: | | |
| Depreciation; Hauling; Installation and Dismantling; Freight, Includes all machinery for Sand, Crushing Stone, Mixing, Depositing, Power, etc. | | 1.25 |
| CONCRETE PLANT and Storage Bins, Crushing Plant and Trestle, Sand Plant, Washing Plant, Main Distributing Plant for Concrete. (Machinery taken care of in previous item) | | .65 |
| OVERHEAD | | .35 |
| PROFIT | | 1.50 |
| Total Cost | | $17.00 |

The 1: 2: 4 concrete in the gates will cost $20.00,—the difference being accounted for by the additional cement required and the cost of forms.

Reinforced concrete is estimated to cost $30.00 per cubic yard.

We have structural steel and castings. We have 18 steel gates, which will weigh 241,000 lbs., and will cost $225.00 per ton. One emergency gate, 3½ tons, $225.00 per ton. We require 18 hoists,—one to each gate, each having

a capacity of 150 tons, will cost $2,500.00. One hoist for emergency sluice gate, $3,000.00. Beams for support and anchorage for hoisting machines, 15 tons, $200.00 per ton. Cast iron castings in gates, frames and guides, 120 tons, at $225.00 per ton. Anchor bars, pipes, nuts and washers 22½ tons at $250.00 per ton.

This dam must be provided with spillway capacity to discharge the largest floods. The past records show that the largest floods have reached about 60,000 cubic feet per second, and the spillway has that capacity outside of the gates. This spillway is formed of 12 surface openings, each 20 feet wide and 25 feet high. These openings will be controlled by Stoney Gates operated by a lifting machine travelling on top of a steel structure provided specially for it. We have 265 tons of steel at $225.00 per ton, 60 tons at $300.00 per ton, and 6 tons at $200.00 per ton,—the cost being $87,400.00.

### Gate-House

Our gate operating machinery must be protected by a gate-house. The minimum dimensions of this structure must be 15½ feet wide by 20 feet high and 296 feet long, being 81,760 cubic feet. It will cost $0.50 per cubic foot—$40,880.00. It must be provided with one Travelling Crane, $1,000.00, Electrical Installation in gate-house and spillways $1,000.00.

Our designs provide for a long sluiceway, which must be 12 feet wide. The opening of that sluiceway to be controlled by stop-logs. The stop-log grooves must be lined with steel and the sill also—the cost $400.00.

On top of the dam must be built a pipe railing estimated to cost $3,130.00.

We have a total of $1,489,878.00, and adding 10% for contingencies, we have a total of $1,638,865.00. This is for the control dam at Bittabee.

Applying the same unit prices and cost for the other units, we have a total cost for dams of $2,641,325.00. To this must be added the transmission line mentioned at first, $64,000.00, $96,000.00 for roads, 20 miles of new telephone line to replace lines which will be flooded, 20 miles at $500.00. This is a bush line—the wire being suspended to trees. New road will have to be built to replace the present road, 20 miles at $2,000.00. Property damages around Baskatong

estimated to $200,000.00. Cost of surveys, field investigation, $100,000.00. Preparation of plans, engineering supervision $200,000.00. Interest during construction, less than a year, $100,000.00. Two houses for the families of the attendants at the dam, $15,000.00. Temporary facilities for handling freight at Maniwaki, $20,000.00. Grand total, $3,486,325.00, say $3,500,000.00.

By this capital expenditure, it is possible to regulate the flow of the river to 8,000 cubic feet per second. The interest on that investment may be taken as 5%, sinking fund in 30 year 1.6%, and operating expenses $25,000.00, say 7½, or $262,500.00. Adding government benefit of $35,000.00 makes a total of $297,500.00, say $300,000.00.

The additional H.P. on the low water basis is 150,000 H.P. The yearly cost would therefore be $2.00 per H.P.

Capitalized on the basis of 6% interest, this annual charge is $33.00 per H.P. The cost per H.P. of the dams, right of way and towers for the transmission lines, operation of the plants, is reduced by a higher figure than is the capital cost for storage. For this reason alone storage is desirable.

Therefore, we come to the conclusion that the storage of water on the Gatineau is most advantageous and we will strongly endorse the project.

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# Some Accounting Terms and Principles That Cost Accountants Should Know

By PROFESSOR R. R. THOMPSON,

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(Before the Montreal Chapter, January 28, 1927)

NOTE.—The full text of this lecture being lengthy, the notes on which it was based are given.

*CAPITAL RECEIPTS* include the following:—

(a) Money and Money's Worth—that is, Assets of all kinds and Services Rendered—contributed to a concern by owners, or lent to the concern for a period longer than a year. These contributions are made with the intention of their being left in the business, and being used in the carrying on of the business.

(b) Net Proceeds from the sale of Fixed or Capital Assets. If the Net Proceeds from a sale exceed the book value of the asset concerned there is a capital profit; if the reverse, a capital loss.

(c) Receipts of money representing Capital Profit or Surplus items, such as:—Premiums on Preferred Stock, Proceeds from sale of Donated Stock.

*Note: Capital Profits* include all money and money's worth, which are brought into the business for the first time, as a result of a capital profit. This will include the profit on the sale of a Fixed Asset, but nothing more. The remainder of the proceeds replaces the Fixed Asset, which was already in the concern.

*Capital Expenditure* includes the following:—

(w) Expenditure made for the purpose of acquiring those Fixed Assets, by the use of which the business is carried on.

(x) Expenditure made for the purpose of putting those Fixed Assets into a condition and into position, so that they may be able to assist in earning profits for the business.

(y) Expenditure made with the intention of increasing the earning capacity of the business.

(z) Expenditure to make good losses of Fixed Assets, which losses have been made outside the ordinary operations, and are regarded as capital losses.

*Revenue Receipts* include the following:—

(1) Receipts of cash from the realization of other Current Assets. This will include cash sales of goods, cash collections of debts, cash realized from bills or notes. When goods or services are sold at a profit, that portion of the proceeds which represents the profit will be included under the category Revenue Profits.

(2) Receipts of profits from investments made outside the business. They may be in the form of rents; interest on bonds, mortgages, or loans; dividends and bonuses on shares.

*Note:* Revenue Profits include all money or money's worth, which are brought into the business for the first time as a result of profits earned in the ordinary operations of the business. This will include the profits on the sale of goods or services, and everything under (2).

*Revenue Expenditure* includes the following:—

(1) Expenditure incurred in the ordinary operation of the business and which is necessary to carry it on. This will include all payments for services rendered, such as wages, salaries, rent, hire of machinery, interest on borrowed capital; and also consumption of stores, or using up of assets, such as consumption of fuel, depreciation of machinery, gradual expiration of a lease or patent, and depletion or using up of a mineral deposit which is being worked to produce revenue.

(2) Expenditure incurred for the purpose of maintaining the fixed assets in a state of working efficiency. It covers all expenditure incurred with the intention of maintaining the earning capacity of the business. It covers all cost of safeguarding assets against ordinary risks of the business.

Examples are as follows:—

Fire Insurance Premiums: Safeguarding against loss of Fixed and Working Assets.

Workmen's Compensation Insurance Premiums: Safeguarding against loss of Current Assets, through payment of cash.

All of this expenditure should be provided for out of Revenue Profits.

Losses which may occur outside the ordinary operations are not included under this category. As a rule each case

must be considered on its own merits. Some may be regarded as losses of capital. The general principles are that, if losses of a certain kind are to be expected, they should be provided for out of revenue. If the risk is insurable, insurance must be taken out, and the premiums charged against profits. If the risk is not insurable, profits should be set aside by a regular charge. Losses outside the ordinary operations, which cannot be foreseen, as a rule, are Capital Losses.

*Maintenance:* Process of continuous attention to machinery and other Fixed Assets. The supply of operating necessities. Revenue Charge.

*Upkeep:* Partial re-creation; anticipation of decay. Revenue Charge.

*Repair:* Reconstruction where damaged or worn-out parts renewed. Revenue Charge.

*Betterment:* An addition intended to increase profit earning capacity of a fixed Asset. Capital charge.

*Periodical Statements showing various aspects of history of a Manufacturing Concern for a period.*

*Manufacturing Statement,* based on Work-in-Process Accounts. It represents the Factory in operation. Its object is to show the Cost of Goods Manufactured. Charge headings suggested are:—

Direct Material.
Direct Labor.
Direct Expense.
Power.
Factory Indirect Charges: Variable.
Factory Indirect Charges: Standing.

*Note:* Definitions of these charge-headings, and also of the items, Inventories of Direct Material, Work-in-Process, and Finished Goods have appeared in a recent issue of Cost and Management; the same definitions were used at this point.

*Trading Statement,* intended to show difference between Net Sales and Cost of Goods Sold, or Gross Profit.

*Profit and Loss, or Operating Statement,* intended to show Net Profit from Ordinary Operations, with use of total Capital employed, no matter whence that Capital was ob-

tained. It must be credited with Gross Profit, and charged with all revenue losses and expenses incurred in the carrying on of the Ordinary Operations.

Charge headings suggested are:—

(a) *Selling Expenses: Warehousing.*

do. *Direct.*

do. *Delivery.*

*Note:* The balance after charging Selling Expenses is sometimes brought down and called the Selling Profit.

(b) *Administrative and General.*

(c) *Financial Management Charges.* This will include cash discounts and interest, discount and interest on bills and notes, bank charges, bad debts, and all those financial expenses and losses, which nearly all businesses can expect in some degree, and which are controllable, more or less, by the officers of the concern. Neglect to take advantage of discounts, carelessness in giving credit, and lack of system in cash collections will invariably cause this item to increase.

*Net Income Statement,* collects all the profits and losses for the period, including those from Ordinary Operations. It will be charged with interest on Capital obtained on loan, and credited with income from investments outside the business. The balance is carried to General Surplus.

*General Surplus Statement* is intended to show the balance of profits or losses available for distribution among the owners, and how distributed or appropriated to Reserves. Adjustments caused by errors in figures for previous periods should be brought into this statement.

*General Surplus.* Separate records should be kept of the following:—

Revenue: Available for disposal as directorate decides.

Capital, Realized: Must be used first to write off Capital Losses, but afterwards can be distributed similarly to Revenue Surplus.

Capital, Unrealized: Must be used first to write off Capital Losses. So long as a Capital Profit is Unrealized, that is to say, it has never been represented on the debit side by cash or an obligation to pay cash, it must not be distributed by way of a cash dividend.

# The Company Controller

By F. A. MANSFIELD

*(From the Journal of Accountancy)*

IN so far as private organizations are concerned, the office of controller is comparatively new, so that the derivation of the word and its manner of application to modern business may be of interest. Prior to the 15th century, the usual spelling of the word was "countrollour," meaning a counter-roller or one who kept the roll of incoming or outgoing monies and goods. In the 15th century the term was adopted in the various offices of the English royal household, such as countroller of accounts in the lord chamberlain's office. This officer was usually a titled gentleman so that the official scribes mistook the first syllable to be a designation of rank and so used the mistaken etymological spelling, compteroller or comptroller. This title gradually spread to government, state and finally in the 20th century to commercial organizations to signfy an officer who keeps financial accounts or sees that they are properly kept and audited.

With the expansion of modern business and its resultant complicated financial and operating methods, the office of controller has now a much wider scope and is one that is rapidly being appreciated as of the highest importance. That this is so is witnessed by the fact that many former controllers have been elevated to company presidencies; for instance, C. G. Dubois, president of the Western Electric Co., and W. S. Gifford, president of the American Telephone & Telegraph Co.

The controller is an executive officer whose duty is to interpret the results of the business operations to the administrative staff and to formulate fresh policies, although in many organizations the mistaken conception of the office confines the controller's activity to that of head bookkeeper, thus limiting his usefulness.

The man chosen for the office should be one who is capable of directing men and training them, so he must have a thorough accounting knowledge and a general business experience besides having executive ability. He is usually appointed by the board of directors and is directly respon-

sible to it through the president. If his work is to be effective, he must have equal rank with the executives in charge of other phases of the business, such as the sales manager. The heads of the accounting and statistical departments should be under the controller's direct control and supervision as he centralizes, co-ordinates and develops the work of these departments. By his experience and qualifications he can make the most extensive use and intelligent interpretation of the accounts.

Apart from these two departments the controller acts in an advisory capacity only and his recommendations are carried out if adopted by the executives in charge of the department concerned. For example, he may recommend the procedure for accounting at branches, but the execution of that system will be left to the branch manager. The controller co-operates with the sales manager with regard to the compilation of statistical data on sales, with regard to the control of the sales department expense budget, and with regard to the preparation of data for the production budget. He co-operates with the factory superintendent, or in cases where there is no factory with the purchasing agent, with regard to the supervision of merchandise purchases in order that they may be kept as low as is possible and consistent with production requirements.

The purpose of the controller is to interpret to the president the financial results of the operations of the company, and as such his function must not be confused with that of the auditor under the British companies acts whose duty is specified by law, or with that of the American public accountant whose duties are varied according to the instructions given to him by the company. The controller is in sole charge of the accounting department and is directly responsible for the accuracy of the accounts, financial statements and all other statistical information relative to the financial operations, and he should formulate such accounting methods as are best adapted to the particular operations of the company.

He should be a participant in all executive conferences in order that any questions with regard to the financial statements may be readily answered, and advice given with regard to the co-ordination of production with sales, and the probable costs, expenses and profits of future operations.

From the executive conferences the controller must obtain authority for all book entries affecting capital, such as the disposal of company assets and the creation of reserve accounts for contingencies. He must interpret the accounts and prepare statistical information for the various department heads when requested to do so or when he is of the opinion that such information will be useful to them. He should maintain a record of all reports that are prepared and of the department heads and others who receive them. After having approved them, he should distribute them in order that duplication of work may be prevented, the establishment and enforcement of operation procedures expedited, and a central control afforded.

The increasing use of the budget system for controlling future operations considerably adds to the duties of the controller, for it is his duty to obtain from the various department heads their selling quotas and estimates of expenses, and to combine them into budgets showing estimated profits for the coming financial year, cash budgets showing capital requirements ,and the various departmental controlling budgets.

While not responsible for the general filing system, it is the controller's duty to maintain files of all reports and correspondence with regard to the accounts and reports, such as journal vouchers, leases, contracts and insurance policies. He is responsible for all state and federal tax returns but must obtain legal advice whenever necessary.

He is often responsible for duties that in the past devolved upon the treasurer, such as the submission to counsel of all contracts, as well as drafting such clauses that affect the financial operations. In many cases the controller combines the office of assistant treasurer with his own, and as such is responsible for all the operations of the cashier's department, although this combination of offices is gradually being eliminated as the responsibilities of the cashier's department unwisely limit his sphere of usefulness as controller.

From the discussion of the position that a controller holds his duties may be evolved. He supervises the accounting department, designs an accounting system best suited to the needs of the organization and decides upon the preparation of such entries and methods that are not in accordance with general routine, such as the interpretation of executive

committee and directors' minutes in so far as they affect the books of account.

He is directly responsible for the accuracy of all financial statements prepared by the accounting department and should personally study them before they are distributed. By financial statements is meant those statements in any business which are now prepared in accordance with established practice and universally understood forms. The major statements are the balance-sheet, which shows what is owned, and the income account, which shows how it has been obtained.

In addition to these statements there are a number of others, both financial and statistical, that give information relative to the financial affairs of particular divisions of the business, and which should be prepared monthly, such as:

(1) Condensed balance-sheets showing comparison of beginning of month and beginning of year.
(2) Supporting schedules for income statement for month and year to date showing comparison with budget and preceding year.
(3) Monthly statement of production with current costs and details of factory expenditures compared with budget.
(4) Daily report of cash position.
(5) Monthly estimates of future cash requirements.
(6) Monthly report of cash receipts and expenditures compared with budget.
(7) Statistical reports in general.
(8) Statutory financial returns.

In preparing any of these statements, the controller must remember that many organizations tend to conceal important changes in financial conditions, but that such action only defers the day of reckoning. Such contingencies often arise because the executives do not realize the condition until too late to remedy it, so as many explanations as possible should be made on the face of balance-sheets and other statements.

One of the most valuable modern adaptations to business of an old method of controlling national funds is the budget. All businesses do not use a budget, but those that have adopted the system are the most profitable and progressive as a general rule. It is the duty of the controller to compose the budget from estimates or forecasts obtained from each

department of the business. He must not merely prepare the budget from the estimates received but must intelligently examine the forecasts to ascertain that activities interdependent upon one another are correctly estimated; for example, the manufacturing program must be based upon expected sales, the investment in inventories must be in keeping with the turnover, etc.

The purpose of this article does not include any complete discussion on budgeting, but the main considerations are that the controller should see that departmental forecasts are obtained well before the commencement of the budget period; he must furnish to department heads full analyses of past expenditures, and then summarize all the forecasts into profit-and-loss budget, cash budget and departmental budgets, and discuss them with the budget committee for approval and submission to the president.

Not only the preparation but the actual carrying out of the budget is under the functional direction of the controller, who exercises supervision over the execution of the budget program.

The office organization under the controller may be summarized as follows:

(1) Head office accounting:
  General ledger.
  Subsidiary ledgers.
  Statistical reports.
  Monthly financial statements.
  State and federal taxes and other statutory returns.
(2) Cashier's departments.
(3) Budget compilation and control.
(4) Cost department:
  Bookkeeping.
  Control entries.
  Cost control.
(5) Branch records:
  Branch expense internal auditing.
  Branch current ledgers.
  Control entries.

The discussion of the duties of the controller and his place in the company organization could be dealt with at considerable length, but this outline, I believe, summarizes the nucleus of any study that may be made of the rights and duties of this comparatively new business executive.

# CHAPTER NOTES

## MONTREAL

Mr. W. J. Barrett, Accounting Engineer of the Metropolitan Life Insurance Company, came from New York for our meeting of March 25 to give us some concrete illustrations of the "Uses of Costs for Better Management Practice." Some months ago, when corresponding about this intended meeting, Mr. Barrett asked for some representative industries about which he would talk and with which our members were connected. Judging by expressions, he was able to interest, very closely, many of those attending by illustrating conditions in their particular industry.

Actual illustrations of the study of costs with the consequent reduction of waste and increase in profits were given in the following industries:—Manufacturers of Artificial Teeth, Lathes, Hosiery, Shoes, Grey Iron Castings, Underwear, Machine Tools, and Electrical Products.

The Speaker was introduced by Mr. F. C. McElroy, who was instrumental in bringing Mr. Barrett to Montreal.

Mr. J. S. Cameron, of the Northern Electric Company, Limited, followed with very interesting illustrations of the Control of Maintenance Costs from the point of view of an engineer keenly interested in costs.

Election of Officers of the Montreal Chapter was held March 25th, the following Members being elected:—

Chairman, R. R. Thompson, C.A. Professor, McGill University.

Vice-Chairman, G. C. Leroux, Assistant Inspector of Taxation.

Treasurer, C. E. Whitten, Secretary, Canadian Paperboard Co., Limited.

Secretary, R. R. Johnson, Henry Birks & Sons, Limited.

Directors, H. D. Clapperton, C.A., Messrs. Riddell, Stead, Graham & Hutchison; D. M. Farish, C.A., Northern Electric Co., Limited; L. A. Peto, Canada Car & Foundry Co., Limited; F. C. McElroy, Consolidated Lithographing & Mfg. Co., Limited; H. Kerrin, L.A.C.G.A., Edward C. Baker,

Kerrin & Company; L. Belanger, L.A.C.G.A., No. 133 Crescent Street; F. Fernie, A. R. Whittall Can Company, Ltd.

## TORONTO

Since the last issue of Cost and Management was published, the Toronto Chapter held its meeting on April 6. The attendance was good. H. E. Guilfoyle, C.A., who was already well known to the Toronto members as one of the active members of the Chapter, spoke in place of R. J. Dilworth on Annual Statements and Balance Sheets. Mr. Guilfoyle was, as usual, instructive and interesting, and a good discussion resulted.

Our annual meeting and dinner, held in the King Edward Hotel on Wednesday evening, April 20, was a distinct success, by reason of the good attendance, the excellent meal and entertainment provided, and the outstanding quality of the address by T. C. McCobb, Treasurer of Imperial Oil, Ltd., which had been arranged as the special feature of the meeting. Mr. McCobb first sketched the development and scope of the oil industry, both on the producing and refining side, and then showed in a general way how the task of determining costs was undertaken. We hope to see his address reproduced in an early issue of our journal.

T. S. Jardine, retiring chairman, presided, and reviewed the chapter's work during the year. The following officers were elected unanimously for the ensuing year:—

R. A. Burdett, Robert Simpson Company, Ltd., Toronto; H. E. Guilfoyle, C.A., Clarkson, Gordon & Dilworth, Toronto; F. Page Higgins, F.C.A., Toronto; T. S. Jardine, United Drug Company, Ltd., Toronto; K. A. Mapp, C.A., Mapp & Mapp, Toronto; R. Oaten, Gurney Foundry Company, Ltd., Toronto; D. C. Patton, Sangamo Electric Company, Ltd., Toronto; G. A. Phare, Lever Bros., Ltd., Toronto; J. R. Pidduck, Neptune Meter Company, Ltd., Toronto; W. G. Pierdon, Hydro-electric Power Commission of Ontario, Toronto; J. W. Spence, Canadian Kodak Company, Ltd., Toronto; James Turner, C.A., T. Eaton Company, Ltd., Toronto.

At a subsequent meeting of the directors, James Turner, C.A., was elected chairman, H. E. Guilfoyle, C.A., vice-chairman, R. A. Burdett, treasurer, and D. C. Patton, secretary.